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THE SITKA SPRUCE WEEVIL
(Pissodes sitchensis)

Family Curculionidae. Order Coleoptera

by

H. E. Burke.

Economic Importance - The most injurious insect enemy of the reproduction Sitka spruce in the Northwest is the Sitka Spruce Weevil (Pissodes sitchensis n.sp.). This small beetle attacks and kills or seriously injures the terminal shoots of many young trees. As a tree cannot reach full development without a terminal it is held back until one of the laterals over-tops its fellows and takes the place of the destroyed shoot. A great deal of important time and energy are thus wasted, and the tree is apt to be crowded out by its more favored companions. Then, in taking the place of the terminal, the lateral grows in more or less of a curve and a crooked trunk is apt to be formed. Sometimes, too, though rarely, no single lateral can gain the lead and a forked and worthless tree is produced.

Trees attacked - Small trees, 2 to 8 inches in diameter and 5 to 25 feet high are usually the most susceptible to attack. No large old trees were found to be infested. The adults will feed on the bark of the bases of old trees when caged, and they may do this at all times.

The Sitka Spruce (Picea sitchensis F.&.M.) was the only species of tree found to be attacked.

SEASONAL HISTORY AND HABITS

Oviposition.- The eggs are laid in the late spring and summer, in little cavities in the bark of the previous year's growth of the terminals or rarely in a lateral. If a lateral is attacked it is almost invariably because the terminal has already been killed a year or two before. The egg-cavities are placed irregularly up and down the terminal, for several inches or more, and usually in the upper half near the tip just below the bud or new shoot of the year. Two eggs are usually placed in each cavity.

In one case young larvae were found below a dead terminal in two-year-old growth. In this case the eggs must have been deposited in the two-year-old bark at the base of the dead shoot or at the bases of the laterals. In another case one brood killed half of the previous year's growth and developed in it. The next year another brood killed the remaining part and developed in it. This shows that although the eggs are usually laid in bark of the previous year's growth they may sometimes be laid in that which was formed two years before.

Larval Habits- Soon after the eggs are laid, the young larvae hatch out and work down the terminal, boring through the bark and in to the wood until at last they reach maturity, form an oval shredded covered cell in the wood or pith and pupate. Where the terminal is large and

Where the terminal is large and vigorous and the wood is thick the pupal cells are formed in the outer wood, but where the terminal is small and the wood is thin they are often formed in the pith.

In the younger stages each larva makes a separate mine for itself. As the individuals grow larger and work downward these mines run into one another, and a large common mines containing many larvae is formed. Often the bark is completely separated from the wood.

As some larvae have better conditions for development than others, they reach maturity first and form their pupal cells. The others keep on working down the shoot until they in turn reach full development and pupate. Pupal cells will therefore be found up and down the infested shoot from near the top to the bottom. Most are near the bottom, however.

Size of Brood.- Though some times the brood is probably composed of at least a hundred larvae to start with, many, and sometimes all, die of disease or are killed by enemies during different stages of their development so that usually only a few reach the adult stage and emerge. Ten or twenty perfect adults would probably be the size of the average brood. Thirty six full-grown larvae and one pupae was the largest brood the writer ever found.

Number of Broods- Pissodes sitchensis appears to be single brooded. Part of the brood, however, may emerge in the fall and part in the following spring or summer. The only eggs seen were found in June, active larvae were collected in June, August, and October, full-grown larvae and pupae were obtained from the pupal cells every month during the investigations, May to November, while young adults were found in the pupal cells during June, August, September, October and November. Thus it appears that from eggs laid in June some larvae develop rapidly, pupate in August, change to young adults and emerge in August or September, while others develop very slowly, remain over the winter and following spring in the larval stage, pupate in May or June, and change to adults and emerge during the second summer. Many intermediate cases occur, so we have an overlapping of broods. In the laboratory adults emerged during January, February, June, and November.

Hibernation.- The insect seems to pass the winter in all stages except the egg. Large larvae, pupae and young adults were about equally common in the pupal cells during the last examinations made in October and November and the first in May and June.

Habits of Adult.- After emerging, the adult spends some time feeding. As observed in the laboratory, it makes numerous punctures in the bark of young shoots. But it will probably feed readily on any fresh bark. On June 23, 1904, five young adults that had recently emerged were placed on the terminal shoot of an eight foot tree and inclosed by a cage of netting. August 17th the cage was examined. Two adults were alive, two were dead,

and one had escaped. There were a number of punctures in the bark which seemed solely for food purposes, as no eggs were found, and at the next examination, on September 21, 1904, the punctures were healing over. Almost the same conditions were noted in a second experiment. June 23, 1904 four adults were caged on the middle of the trunk of a six-foot tree. July 13, 1904, one live and one dead adult were in the cage, and the bark was riddled by their punctures. September 21, 1904, the punctures were healing over. No eggs were found and evidently none had been deposited.

From the many small scars seen on the terminals and branches of the young trees examined and the apparent long life of the adult, it seems probable that it feeds extensively in this manner on the live bark for several months before mating and ovipositing.

Indications of Attack.- The first indications of an attack by Pissodes are the punctures in the bark made by the adult for food and oviposition. These cause a slight flow of resin which might be noticed by a close observer. About the middle of July or the first of August the new shoots which have grown from the top of the infested terminal begin to wilt. Examination will probably show the bark of the last year's terminal dead and loose, with Pissodes larvae and pupae, dipterous larvae, and hymenopterous larvae and cocoons beneath it. The wilting of the top shoots soon becomes more evident and the needles begin to turn yellow, brown, and red. By the middle of August, or even some time before, the death of the top is plainly evident and the needles begin to fall. In some cases all fall off before spring, while in others they may keep their color and hang on until the next spring or summer.

Character and Extent of Damage.- After the needles fall the withered shoots and the bark get blown or rubbed off and only the weather-beaten stub of the terminal remains. The laterals at the base of this begin a fight for supremacy. Usually one soon overtops the rest and grows up to form the main trunk. Generally this takes place in three or four years and one could hardly tell that the tree was ever attacked. Some times quite a bend remains in the trunk for several years, but it usually gradually becomes straight and forms a normal tree. I have never yet seen a large tree in the forest which showed any signs of having been attacked in its younger days.

The damage, therefore, usually consists in the retarding of the growth of the tree for several years and the waste of vitality required for building up a new shoot to take the place of the destroyed terminal. As the tree finally straightens up and forms a perfect trunk the commercial damage is probably slight. The dying top and temporary deformity cause the tree to be unsightly when used as an ornament. Then a fungus or other disease might enter the trunk through the dead stub and cause the deformation or death of the tree.

NATURAL ENEMIES.

Predaceous.- Dipteran. The small, slender, cylindrical, white larva of Lonchaea polita Say, a small dipteran of the family Lonchaeidae, seems to be the most destructive enemy of Pissodes sitchensis. It is invariably found under the dead bark and in the Pissodes pupal cells in infested terminals. It is often found feeding on dead larvae and pupae of Pissodes, and in a number of cases on Pissodes larvae and pupae which seemed to have been recently killed by it. It appears to be a very effective predaceous enemy byt may only be a scavenger with strong predaceous tendencies. Often it is the only inhabitant of the dead tops, the Pissodes brood being completely destroyed. The larvae are common under the bark of the dead, Pissodes-killed, tops throughout the year. The pupae are formed there in May and June, during which months the adults also emerge.

Lepidopteran.- In two cases a lepidopterous larva, probably a Phycitid, was found under the dead bark of Pissodes killed tops. This seems to be the same species or a near relative of the eastern species, Dioryctria abietella D.& S., Which has been observed to feed on the larvae of Pissodes strobi. The western form was not observed to feed on Pissodes,but it probably does so. The larvae were collected in August and September,1903.

Parasites. Hymenopterous- A number of hymenopterous parasites were reared from the Pissodes-killed tops. These are representatives of the Braconid genera Coeloides, Brachychistes, and Macrodyctium, two chalcids and one cynipid. Most of the braconids were reared from cocoons found in the fall in Pissodes pupal cells. The chalcids and cynipid were reared from infested tops. Chalcid larvae were fairly common in Pissodes pupal cells in the fall.

Disease- A bacterial disease seems to destroy some broods. It is probably caused by too much moisture under the bark. The larvae turn black, become watery, swell up and die.

REMEDIES.

By cutting the infested shoots in May and September and placing them in tight cages this insect should be readily controlled. The parasites will hatch out and can be liberated, while the Pissodes can be caught and destroyed. If this is carefully carried on for a few years to catch the broods from the old adults that were in hibernation at the first collection the insect should be practically exterminated. If the infested shoots are carefully cut from the tops of the trees and some pruning is done to give one leading branch a clear field the tree will soon straighten up and no bad effects will result from the attack of the weevil.

Change -

Cryptorynchus lapathi L. in files to

Sternochaetus lapathi (L.)

Under Coleoptera - 342.4

Curculionidae

CRYPTORHYNCHUS LAPATHI (L.)

Changed to

STERNOCHAETUS LAPATHI (L.)

M. cuneiformis Horn.

Type fm Neb. also fm Col. Mont., Wash. N Mex. Sou Calif.

Prothorax is nearly a quite black, the elytra dark blue. Hairs of under surface simple.

Pinus ponderosa - Ft. Garland, Colo.

M. moris. Fall

Ariz. New Mex. Differs fm cuneiformis by its color, dull lustre, finer less impressed elytral striae and wider intervals.

M. hesperides Lec

Me to B.C. N. Mex & Calif. Pines.

M. perforatus Horn.

Recognized by its very coarse, deep, dense sculpture, with unusually narrow elytral interspaces.

New Hampshire to Georgia.

M. lecontei Horn. — Pinus Lambertiana, Mariposa grove Calif.

True lecontei is much the largest, specimens under 4mm in length very rarely occurring, while this size is seldom if ever attained by any of the allied species.

Common in Rocky Mts & westward. 2nd funicular joint is unusually elongate, being fully twice as long as wide and as long as the two following.

superba fm Prescott Ariz. — Pinus ponderosa. S.F. Mts, Flagstaff Ariz.

tenebrosa — New M. Colo. Calif.

trachypennis fm Cloudcroft N.M. & Ariz

M convexicollis Fall

San Bernadino Mt. Calif. Easily separable fm lecontei by the small size, somewhat narrower form, more convex thorax, which is less narrowed anteriorly, shorter second funicular joint and more strongly impressed elytral striae, with narrower more convex intervals.

M. vitiosa Fall

Lake Tahoe, Calif.

M. proxima.

Santa Clara Co. Calif. Humboldt Co Calif. Pinus radiata, Palo Alto, Calif.

The eyes in the male type are separated by scarcely more than 2/3 the width of the beak.

M striata Fall.

Mt Watson, Calif.

M. abietacea. Picea engelmanni., Clyde Colo.

High mts - East & BC. Oregon, Calif.

M. imbellis Lec.

Sonoma Co. Calif.

M. gentilis. Pinus jeffreyi - Bishop Cal.

Recent adv. in Boreleus.
Bryde Blakeslees
Recent adv in Phys.
Evans Blake
Mucbridas Cobbaches
Tallon
Will v Wilco.

Quat Rev. Biol Sept 1927 vol 1 no. 3
Will & Wilk Co.

Magdalis - species with toothed claws.
Western species
gracilis, aenescens, subtincta.
First two are distinguished by the very densely punctate thorax and the obvious pubescence of the upper surface, the scutellum quite densely clothed.
They are very closely allied & dependence seems to have been placed entirely on the aeneous surface lustre of aenescens
In gracilis the striae are uniformly deep, the intervals convex and uniform.
aenescens occurs from sou. Alaska to N. Calif.
gracilis - " around San Francisco & western Nevada.
Subtincta - differs from the two preceding by the more coarsely and densely punctured thorax, and in no obvious pubescence on the upper surface.
Type-locality - Gilroy Calif, also Calif, Ore. B.C. Mont, Col. N. Mex.
Black or nearly so, although some have a faint blue or green tint

aenescens - Pyms, Corvallis, Ore. Elmo Hoaquin Wash.

Group Lecontei

Subgroup lecontei

Size larger, 3½-7 mm, color typically rather brilliant blue or blue-green — lecontei

Color purpureo-violaceous, varying to green — var superba

Color black throughout — var tenebrosa

Color black, elytra dark blue or bluish black — var tinctipennis

Size smaller, 3-4 mm. black throughout, or with the elytra faintly bluish

Prothorax strongly convex, beak longer and more arcuate, elytra faintly bluish, moderately shining, intervals narrow, convex. — convexicollis

Prothorax normally convex, beak less strongly arcuate, color black lustre dull, elytral intervals flatter & more rugose — austera

Both ♂ & ♀ prothoracic punctures more or less longitudinally confluent, elytra with dark blue or greenish lustre — var substriga.

Subgroup gentilis

Femoral tooth obtuse, rudimentary, antennae (♂) inserted very slightly behind the middle of the beak, second funicular joint much less than twice as long as wide. — vitiosa

Femoral tooth acute, well developed.

Elytral striae lightly or scarcely impressed, the intervals nearly flat.

Beak in ♂ fully as long as, and in the ♀ distinctly longer than the prothorax — gentilis

Beak in ♂ evidently shorter than, and in the ♀ subequal in length to the prothorax; eyes a little less distant; entirely black, surface duller and more rugose — proxima

Elytral striae rather strongly impressed, the intervals distinctly convex — striata

Subgroup alutacea

Black, opaque, head rather sparsely punctate; antennae (♀) inserted at middle of the beak, funicle more slender — alutacea

Reddish-brown, opaque, head very densely punctured, antennae (♀) inserted distinctly beyond the middle of the beak, funicle stout. — imbellis

H.C. Fall: a brief Review of the Species of Magdalis Trans Ent. Soc Am. Vol 39, p 23 1913.

Antennal club normal in both sexes.

Femora not toothed, the anterior ones obliquely impressed at base in the posterior face; hind angles of thorax feebly produced and scarcely at all everted

Group cuneiformis

Femora toothed, not impressed at base; hind angles of thorax more or less produced and divergent.

Group lecontei

Antennae inserted approximately at basal two fifths of the beak in the ♂ and at basal one-third in the ♀.

Subgroup lecontei

Antennae inserted at or slightly behind the middle in the ♂, a little more posterior in the ♀, usually at or near basal 2/5. Subgroup gentilis

Antennae inserted distinctly beyond the middle in the ♂ and at about the middle in the ♀ Subgroup alutacea

Antennal club in the ♂ greatly elongate and thickly clothed with erect pile

barbicornis

Group Cuneiformis

Blue, moderately shining, first and second funicular joints subequal, the first not much shorter Length 5½-8 mm. cuneiformis

Black

Elytral intervals wider than the striae, except occasionally in hispoides

First and second funicular joints subequal, the first not or scarcely wider than the 2nd; strial punctures of elytra smaller, intervals perfectly flat and nearly three times as wide as the puncture at middle of disk; body beneath densely punctate Size large, 6 mm. morio

First funicular joint much shorter than the 2nd; strial punctures of elytra larger, the intervals flat or slightly convex and from one to two times as wide as punctures at middle of disk; body beneath rather sparsely finely punctate; size smaller 3-4½ mm. hispoides

Elytral intervals narrower than the striae; punctuation coarse; size 4½-5½ mm. perforatus

Economic Importance

The Sitka Spruce Weevil (*Pissodes sitchensis*) is the most injurious insect enemy of the reproduction of Sitka spruce in the Northwest. This small snout beetle attacks and kills or seriously injures the terminal shoots of many young trees. As a tree cannot reach full development without a terminal it is held back until one of the laterals over-tops its fellows and takes the place of the destroyed shoot. A great deal of important time and energy are thus wasted, and the tree is apt to be crowded out by its more favored companions. Then, in taking the place of the terminal, the lateral grows in more or less of a curve and a crooked trunk is apt to be formed. Sometimes, too, though rarely, no single lateral can gain the lead and a forked and worthless tree is produced.

History:

The Sitka Spruce Weevil was first described in 1911 by Dr. A.D. Hopkins from specimens collected in Oregon and Washington by H.E. Burke

Description of the Insect:

The Sitka spruce weevil belongs to the group or family of snout beetles known as Curculionidae. They may be recognized by their long peculiarly shaped beaks or snouts. This insect passes through four stages during its life cycle. The adult female weevils lay eggs in the terminal shoots of Sitka spruce and from these the larvae hatch and feed downward in the cambium. At the end of the feeding and growing period the insect pass through a pupal or resting stage before transforming to adult weevils which feed more and lay more eggs.

Description of the egg:

Characters common to the ~~genus~~ species of the genus Prissodes are: Eggs, pearly white, slightly oblong, and equally rounded at both ends.

Description of the Larva:

The larvae of the Sitka Spruce Weevil are elongate, cylindrical, yellowish white, footless; body with 12 closely wrinkled segments, those of the thorax not larger or more permanent than the first abdominal.

Description of the Pupa:

Of the general size and form of the adult, with the beak folded on the mesosterna and metasterna; tips of the posterior tarsi even with tips of wing-pads; head, beak, and abdominal segments armed with spines, the ninth abdominal having a rather prominent epipleural spines.

Description of the adult:

The Sitka spruce weevil is a small grayish mottled snout beetle varying in length from 5 to 5.3 m.m. The color ranges from light to dark brown. The spots of scales vary in size, color, and density and there is some variation in the relative width of the prothorax and in the size of the punctures of the elytrial striae.

The beak is slender and shorter than the prothorax in some species and longer in others. The third and fifth elytral interspaces are moderately to strongly elevated and rugose. They have large anterior spots on the elytra. The elytral striae are rather coarse punctured. They are most easily identified by their distribution and habits.

Description of the Work:

The indications of an attack by Pissodes are the punctures in the bark made by the adult for food and oviposition. These cause a slight flow of resin which might be noticed by a close observer. About the middle of July or the first of August the new shoots which have grown from the top of the infested terminal begin to wilt. Examination will probably show the bark of the last year's terminal dead and loose, with Pissodes larvae and pupae, Dipterous larvae, and hymenopterous larvae and cocoons beneath it. The wilting of the top shoots soon become more evident and the needles begin to turn yellow, brown and red. By the middle of August, or even some time before, the death of the top is plainly evident and the needles begin to fall. In some cases all fall off before spring, while in others they may keep their color and hang on until the next spring or summer.

After the needles fall the withered shoots and the bark get blown or rubbed off and only the weather beaten stub of the terminal remains. The laterals at the base of this begin a fight for supremacy. Usually one soon overtops the rest and grows up to form the main trunk.

Food Plants:

The Sitka Spruce (Picea sitchensis F. & M.) ~~is~~ the only species of tree from which this insect has been reported.

Distribution:

This weevil probably occurs over the entire range of Sitka Spruce, in the coast region and inland about fifty miles from Alaska to northern California. It occurs in Alaska, British Columbia, Washington, Oregon ~~and northern Calif~~.

Life History and Habits:

The adult female weevils lay their eggs in the late spring and summer, in little cavities in the bark of the previous year's growth of the terminals or rarely in a lateral. If a lateral is attacked it is almost invariably because the terminal has already been killed a year or two before. The egg-cavities are placed irregularly up and down the terminal, for several inches or more, and usually in the upper half near the tip just below the bud or new shoot of the year. Two eggs are usually placed in each cavity. Although eggs are usually laid in bark of the previous years growth they may sometimes be laid in that which was formed two years before.

Soon after the eggs are laid, the young larvae hatch out and work down the terminal, boring through the bark and in to the wood until at last they reach maturity, form an oval shredded covered cell in the wood or pith and pupate. Where the terminal is large and vigorous and the wood is thick the pupal cells are formed in the outer wood, but where the terminal is small and the wood is thin they are formed in the pith.

In the younger stages each larva makes a separate mine for itself. As the individuals grow larger and work downward these mines run into one another, and a large common mine containing many larvae

is formed. Often the bark is completely separated from the wood.

As some larvae have better conditions for development than others, they reach maturity first and form their pupal cells. The others keep on working down the shoot until they in turn reach full development and pupate. Pupal cells will therefore be found up and down the infested shoot from near the top to the bottom. Most are near the bottom, however.

Pissodes sitchensis Hopk. appears to be single brooded. Part of the brood, however, may emerge in the fall and part in the following spring or summer. The only eggs seen were collected in June, active larvae were collected in June, August, and October, full-grown larvae and pupae were obtained from the pupal cells every month from May to November, while young adults were found in the pupal cells during June, August, September, October and November.

The insect seems to pass the winter in all stages except the egg. Large larvae, pupae and young adults were about equally common in the pupal cells during the last examinations made in October and November and the first in May and June.

After emerging, the adult spends some time feeding. As observed in the laboratory, it makes numerous punctures in the bark of young shoots. But it will probably feed readily on any fresh bark. ~~On June 23, 1904, five young adults that had~~

~~recently emerged were placed~~

Sessional History:

Adult pissodes appear in the late spring and summer and lay eggs in the terminal shoots of Sitka spruce. The eggs soon hatch and the resulting larvae feed and appear to develop at varying rates of speed. It appears that from eggs laid in June some larvae develop rapidly, pupate in August, change to young adults and emerge in August or September, while others develop very slowly, remain overwinter and the following spring in the larval stage, pupate in May or June, and change to adults and emerge during the second summer. Many intermediate cases occur, so we have an overlapping of broods.

The insects pass the winter in all stages except the egg.

Ecological Relationships:

Pissodes sitchensis confines its attack almost entirely to the previous year's growth on the terminal shoots of Sitka spruce. Laterals are never attacked unless the terminal has previously been killed. Small trees, 2 to 8 inches in diameter and 6 to 25 feet high are usually the most susceptible to attack. No large old trees were found to be infested. The adults will feed on the bark of the bases of old trees when caged, and they may do this at all times.

Prevention and Control Methods:

Artificial Control: By cutting the infested shoots in May and September and placing them in tight cages this insect should be readily controlled. The parasites will hatch out and can be liberated, while the Prisodes can be caught and destroyed. If this is carefully carried on for a few years to catch the broods from the old adults that were in hibernation at the first collection the insect should be practically exterminated. If the infested shoots are carefully cut from the tops of the trees and some pruning is done to give one leading branch a clear field the tree will soon straighten up(?) and no bad effects will result from the attack of the weevil(?).

Natural Control: - Predaceous, - Dipteron, larvae of Lonchaea polita Say, is the most destructive enemy of Prisodes sitchensis Hopk.

a lepidopteron, near (Dioryctria abietella D. & S. an enemy of Prisodes strobi.) probably feeds on P. sitchensis.

Hymenopterous parasites, Braconids, Brachychistes, and Macrodyctium, two chalcids and one cynipid have been reared from Prisodes killed tops.

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Believed to be by H. E. Burke
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1/28/58

Hopk Nos - 18917